



Action Plan for a Resilient Great Lakes Basin

2022

The Great Lakes basin is home to over 34 million people, sustains a \$6 trillion economy and contains over 90% of North America's supply of surface freshwater. The Great Lakes provide drinking water for millions of people and are home to key industries for Canada and the United States, including steel production, agriculture, automotive, manufacturing, recreation and tourism, maritime transportation, and much more.

Governance in the basin is complex and collaborative, consisting of two federal governments, eight U.S. states and two Canadian provinces, Tribes, First Nations, Métis¹ communities, and three regional commissions, all of which play important roles to collectively ensure the health and vitality of the Great Lakes basin.

Changes in climate, increased variability of lake levels, and other changing conditions continue to affect the people, places, economy, and environment of the Great Lakes basin. The effects of these changes include increased risks to existing water resource quality and supply, agriculture, maritime navigation, infrastructure, biological organisms, shorelines and coastal zones, and existing restoration efforts. While efforts to address these items are already underway in each of the Great Lakes basin jurisdictions, there is a recognized need for information sharing of best practices, coordinated policies, enhancing planning and actions to build resilience and adaptive capacity in these and other areas as well as across jurisdictions.

To build and establish regional coordination around climate resilience, the Great Lakes Commission (GLC), with the input of many partners, created an **Action Plan for a Resilient Great Lakes Basin**.

¹ Provincially recognized Métis communities in Canada

The action plan helps to prioritize efforts and forms a roadmap to advance climate resilience in the Great Lakes basin. The action plan leverages existing efforts and supports collaboration among jurisdictions to promote shared learning and resources, and to create strategic partnerships that accelerate efforts for a more resilient and adaptive Great Lakes basin and that the waters of the Great Lakes are fishable, swimmable, and drinkable for everyone in the region.

The GLC recognizes that although many studies and assessments already exist or are underway, there is an urgent need to better understand the effects, impacts and risks related to climate change that are specific to the Great Lakes basin. The GLC also acknowledges the extensive range of methods and best practices for proactive, reactive, and adaptive response being assembled by the U.S. federal government, Canadian federal government, state governments, provincial governments, Tribes, First Nations, Métis, municipal authorities, non-governmental organizations, private sector organizations, and academia. The GLC endeavors to connect and share existing knowledge and resources, collaborate on developing new knowledge, and ensure diverse and varied knowledge, expertise and resources are made available and applied throughout the basin.

Changing Conditions and Climate-Related Stressors: Impact on the Great Lakes

While the Great Lakes basin is dynamic, variable, and has experienced cyclical changes throughout history, there is growing evidence that the variability and changes are occurring more rapidly, becoming more extreme, are getting more costly and affecting more people.

Government data provided by both the Canadian and U.S. governments forecast substantial changes to the Great Lakes in several areas. Increasing water temperatures present a host of challenges, including threats to water quality, health of native species, and the proliferation of harmful algal blooms. Predictions of increased variability in lake levels highlight the recent record-high water levels and their impacts on erosion and flooding and risk to public and private infrastructure. These high-water years quickly followed a period of record-low water levels that resulted in substantial challenges for maritime navigation and habitat preservation. Increasing precipitation and more frequent extreme storm events exacerbate concerns related to flooding, nutrient pollution, and contamination throughout the watershed. These are just a few challenges that leaders throughout North America will face in the coming years as they work together to protect and preserve the Great Lakes.

Changing conditions will also have differing impacts on communities throughout the region, with some communities impacted more significantly than others. It is important for the many members of the Great Lakes community to develop a shared understanding of the science, challenges, goals, and desired outcomes in order to be more equitable and effective in allocating resources to support responding to these challenges. To address this, the GLC assembled a Standing Committee on Climate Resilience (Standing Committee) to bring the Great Lakes community together to share knowledge, identify priorities, and work together toward a more resilient Great Lakes basin.

Defining Resilience

The unique attributes of the binational Great Lakes basin require a common definition of "resilience." By establishing a common definition, the many jurisdictions and members of the Great Lakes community can establish common goals, work toward common outcomes, and pursue coordinated actions with one another as appropriate.

The Great Lakes basin is defined, by the Great Lakes Basin Compact of 1955, as follows:

The Great Lakes Commission created by Article IV of this compact shall exercise its powers and perform its functions in respect to the Basin which, for the purposes of this compact shall consist of so much of the following as may be within the party states:

- 1. Lakes Erie, Huron, Michigan, Ontario, St. Clair, Superior, and the St. Lawrence River, together with any and all natural or manmade water interconnections between or among them.
- 2. All rivers, ponds, lakes, streams, and other watercourses which, in their natural state or in their prevailing conditions, are tributary to Lakes Erie, Huron, Michigan, Ontario, St. Clair, and Superior or any of them or which comprise part of any watershed draining into any of said lakes.

The Standing Committee developed a common definition for resilience for the Great Lakes basin, as defined below. This definition was adopted by the GLC in October 2021 at the GLC Annual Meeting:

A resilient Great Lakes basin is one in which communities, infrastructure, ecosystems, and the economy can withstand, adapt to, and recover from climate-related stressors and changing conditions to ensure equitable and inclusive social, economic, and environmental well-being across the basin.²

This definition provides a common understanding and foundation for this action plan. The GLC will utilize this definition throughout its related work.

Building on Past Accomplishments — Current Activities Contributing to Great Lakes Resilience

Great Lakes community members throughout the basin are already working to make the Great Lakes basin more resilient to the impacts of climate change. The Standing Committee is committed to helping facilitate coordinated efforts to ensure existing data, tools, and resources are leveraged to their fullest capacities. Recognizing this ongoing work is an important step toward understanding the status of resilience in the Great Lake basin, as well as identifying areas of opportunity for stakeholders to work together to increase resiliency.

² GLC Resolution: Promoting Climate Resilience in the Great Lakes Basin.

https://www.glc.org/wp-content/uploads/FINAL-GLC-Resolution-Climate-Resiliency-20211014.pdf

Government activities at all levels, as well as other activities by non-governmental organizations, private sector organizations, and academia all continue to advance climate resilience efforts throughout the basin. This includes funding and conducting critical research, modeling, and forecasting to ensure decision-makers have the science and data available to enact policies that advance climate resilience; examples include the International Joint Commission's Decadal Great Lakes Science Plan, the U.S. Geological Survey's Great Lakes Science Forum, NOAA's Great Lakes Integrated Sciences and Assessments program, and the Great Lakes Observing System's Smart Great Lakes Initiative. Governmental and non-governmental collaborators have also developed a variety of tools and training resources to assist communities with their climate resilience efforts. Many stakeholders are implementing projects and programs that leverage these data, tools, and training resources to make the Great Lakes basin more resilient and adaptive to a changing climate. Finally, organizations in the basin play a vital role in education regarding the challenges of the changing environmental conditions and advocating for effective policies and adequate funding.

The GLC, through Blue Accounting, will provide a hub to show the status of existing efforts and track progress toward regional goals. The GLC will also host an interactive resource library to help highlight existing knowledge, helping to connect resources to stakeholders. This resource is being developed through a partnership with the University of Michigan Ford School of Public Policy.

Purpose of the Action Plan and Community Roles

All members of the Great Lakes community have a role to play in securing a more resilient Great Lakes basin. The GLC recognizes its unique ability as an agency representing states and provinces in the Great Lakes basin to convene representatives from different governmental and nongovernmental organizations including the U.S. federal government, Canadian federal government, state governments, provincial governments, municipal governments, non-governmental organizations, private sector organizations, academia, Tribal Governments, First Nations and Métis to share knowledge, develop goals, and track progress.

The GLC worked with representatives from many of these groups to create this action plan, which is intended to address several related needs. First, the action plan will provide overall direction to the GLC for the development of strategic projects, advocacy, and interaction with the Great Lakes community on issues related to climate resilience. Second, the action plan will be used by the GLC to promote collaboration among its party states and provinces, as well as GLC Observers, on efforts related to climate resilience. Third, the action plan will help inform, guide and promote collaborative efforts among other external entities, as mentioned above.

Members of the Great Lakes community, including government, non-governmental organizations, the private sector, and academia are defining their respective roles in pursuing a more resilient Great Lakes basin. These roles will shift as climate resilience efforts develop over time and as additional opportunities for collaboration are identified. The GLC will continue to coordinate with these entities to highlight opportunities for multi-jurisdictional and cross-sector collaboration, recognizing that successful regional collaboration that is complimentary in nature will lift up individual efforts. Collective effort among the many partners in the Great Lakes community will be crucial in defining future roles, avoiding duplication of efforts, and ensuring projects and products related to climate resilience reach their intended audiences.

Understanding the Action Plan

This action plan is organized around four primary goals that will drive activities to make the Great Lakes basin more resilient to the impacts of climate change:

- **1.** Individuals and communities are healthy, thriving, and adapted to the effects of changing conditions and climate-related stressors.
- **2.** Buildings and infrastructure are safe and can withstand the effects of changing conditions and climate-related stressors.
- **3.** Ecosystems are healthy throughout the Great Lakes basin and adapting to changing conditions and climate-related stressors.
- 4. Environmental and public services support economic activity and building resiliency.

The Standing Committee utilized a logic model approach to develop these goals and associated recommendations for regional action. The GLC received guidance from National Oceanic and Atmospheric Administration (NOAA) on utilizing the logic model approach. For the purposes of this report, the Standing Committee used the following approach outlined by NOAA's logic model framework to structure recommendations for each goal:

Actions are the strategies, processes, methods, tools, events, technology, and activities of the planned program. These may include products, services, and infrastructure (structure, relationships, and capacity used to bring about the desired results)

Outputs are the direct products of program activities, usually described in terms of the size and/or scope of the services and products delivered or produced

Outcomes:

- Short-term Outcomes are specific changes in target audience attitudes, awareness, knowledge, skills, or level of functioning expected to result from program activities
- Mid-term Outcomes are changes in behaviors, condition, or level of functioning expected to result from the changes described in the Short-term Outcomes
- Long-term Outcomes are organizational, population, community, or system level changes expected to result from program activities, such as improved conditions or increased capacity

In addition, the Standing Committee identified additional actions necessary to build capacity and accountability for achieving the four resiliency goals. These supporting actions were also developed using the logic model framework described above.

GOAL 1

Individuals and communities are healthy, thriving, and adapted to the effects of changing conditions and climate-related stressors.

Ensuring the health and vitality of the more than 34 million people and countless communities that call the Great Lakes basin "home" is a central responsibility of the Great Lakes community comprised of governments, non-governmental organizations, private sector entities, and academic institutions throughout the region. Understanding and addressing the disproportionate impacts of a changing climate on indigenous communities and historically under-resourced communities is critical to ongoing efforts to build equity throughout the region.

Recommended Action 1.1

The Great Lakes community raises awareness of ongoing projects to understand cumulative effort and identify gaps related to climate resilience

The Great Lakes community engages in active listening to incorporate local input to assess needs, concerns, and potential solutions, and to connecting community concerns with elected officials

GLC establishes regular convenings for the Great Lakes community to share expertise and coordinate on activities related to climate resilience

GLC establishes and/or expands peer-to-peer networks, similar to its Green Infrastructure Champions program to facilitate knowledge-sharing and adoption of best practices

Share lessons learned and successes with water managers to help improve our shared understanding of management.

Recommended Output 1.1

Federal, state, provincial, and municipal authorities utilize a common forum (including a diverse cross-section of community members) to coordinate resilience efforts at a watershed level; the GLC helps facilitate this forum

Desired Outcomes

SHORT-TERM

Communities and government agencies recognize the importance of two-way information sharing and dialogue about impacts of climate change, learn from each other, pursue equitable solutions, and build capacity among local groups

MID-TERM

Communities and government agencies use established channels to collaborate on efforts related to climate resilience

The Great Lakes community addresses gaps in resilience program efforts and collaborates across jurisdictional boundaries

Federal, state, and provincial governments provide resources to local authorities to develop resilience plans and expand resilience planning capacity

LONG-TERM

Federal, state, provincial, Tribal, First Nation and Métis, and municipal authorities provide ongoing support for climate resilience efforts in the Great Lakes basin

GOAL 2

Buildings and infrastructure are safe and can withstand the effects of changing conditions and climate-related stressors.

Buildings and infrastructure are critical components of healthy and thriving communities. Governments, municipal authorities, planning agencies, utilities, and the construction industry should work to understand how changing conditions and climate-related stressors impact buildings and infrastructure, and implement practices to ensure buildings and infrastructure are safe and functional into the future.

Recommended Action 2.1

Recommended Output 2.1

Great Lakes community convenes forum to share best practices, consider necessary tradeoffs, and identify opportunities for collaboration related to coastal resilience The U.S. Army Corps of Engineers Great Lakes Coastal Resiliency Study identifies coastal areas vulnerable to climate-related stressors; identifies a range of approaches to improve coastal resilience including increased use of nature-based solutions; establishes a collaborative framework to support the effective management of coastal resources; and identifies, selects, and prioritizes future coastal investments

Define GLC's role in communicating/facilitating implementation of resilience activities that are beyond the purview of USACE

Desired Outcomes

SHORT-TERM

Resources such as the Great Lakes Coastal Resiliency Study and the Great Lakes – St. Lawrence Cities Initiative coastal resilience needs assessment survey are utilized to identify and prioritize coastal resilience activities

MID-TERM

The Great Lakes community prioritizes investment and activities in areas of urgent need and at high risk of negative impacts from changing conditions

LONG-TERM

Coastal communities are more resilient and prepared for flooding erosion, and harmful algal bloom events

GOAL 2 CONTINUED ON NEXT PAGE

GOAL 2 CONTINUED

Buildings and infrastructure are safe and can withstand the effects of changing conditions and climate-related stressors.

Recommended Action 2.2

GLC and other partners advocate for investments in the Great Lakes Navigation System that increase system resilience to changing conditions

GLC and other partners advocate for investments in non-federal harbors and recreational navigation systems

Recommended Output 2.2

The Great Lakes community develops climate resilience plan/roadmap for maritime transportation infrastructure

Desired Outcomes

SHORT-TERM

Federal governments provide increased permanent icebreaking capacity for Canadian and U.S. Coast Guards

States and Federal governments recognize need for dedicated maritime transportation and economic development programs that can contribute to system-wide collaboration and implement the Regional Maritime Strategy adopted by the Great Lakes – St. Lawrence Governors and Premiers

MID-TERM

States and Federal governments utilize new and existing infrastructure development programs to support maritime navigation upgrades on system-wide level

Federal, state, and provincial governments support programs and the development of resilient port and marina infrastructure

LONG-TERM

The Great Lakes Navigation System and St. Lawrence Seaway are adaptable to changing conditions and continue to facilitate safe and dependable navigation

Ports and marinas provide safe and consistent connections between land and water in all conditions

Port economic development efforts contribute to climate resilience

Recommended Action 2.3

GLC and other partners advocate for water infrastructure investments by the U.S. federal government that respond to and address climate stressors in the Great Lakes basin **Recommended Output 2.3**

GLC develops an infrastructure blueprint for the Great Lakes basin to guide future investments

Desired Outcomes

SHORT-TERM

The Great Lakes community recognizes need for dedicated programs and investments that support water infrastructure services and improve Great Lakes water quality

MID-TERM

Municipalities invest in improvements to make water infrastructure more resilient to impacts of changing conditions and climate-related stressors

Federal, state, and provincial governments invest in natural infrastructure to improve Great Lakes water quality in response to climate-related stressors driving harmful algal blooms

LONG-TERM

Communities in the Great Lakes basin have consistent access to affordable, clean water

GOAL 3

Ecosystems are healthy throughout the Great Lakes basin and adapting to changing conditions and climate-related stressors.

The complex and diverse ecosystems throughout the Great Lakes basin define both the geography and the cultural identities of Great Lakes communities. Regional decision-makers should plan for and employ practices that monitor, manage, restore, and protect natural systems throughout the Great Lakes basin.

Recommended Action 3.1

GLC convenes forum for the Great Lakes community to share experience and expertise related to ecosystem restoration, protection, and management

GLC and other partners advocate for ecosystem restoration, protection, and management investment by federal governments

Recommended Output 3.1

States and provinces share best practices on shoreline planning, development, and management on a basin-wide scale that reflects rapid fluctuations in water levels and the impact of erosion

GLC provides a resilient ecosystems blueprint to inform regional investments

Desired Outcomes

SHORT-TERM

Increase understanding of climate impacts through Traditional Environmental Knowledge (TEK), as appropriate and in collaboration with Tribal and First Nation and Métis communities

The Great Lakes community recognizes the importance of healthy and diverse coastal and riparian ecosystems

MID-TERM

The Great Lakes community addresses nutrient pollution, wetland loss, beach loss, and coastal erosion to maintain healthy ecosystems

The Great Lakes community plans for ecosystem restoration and management investments on a watershed scale

LONG-TERM

Great Lakes basin ecosystems are more resilient to changing conditions and climate-related stressors

GOAL 4

Environmental and public services support economic activity and building resiliency.

The Great Lakes basin represents a \$6 trillion USD economy, which would be the third largest economy in the world. Governments, municipal authorities, nongovernmental organizations, private sector entities, and economic development agencies should continue to support policies and investments that contribute to the resilience of the Great Lakes environment and economy.

Recommended Action 4.1

Convene economic development entities to highlight opportunities and discuss threats related to the blue economy

Assess the impact of Great Lakes water quality and harmful algal blooms on the blue economy

Recommended Output 4.1

GLC engages state, provincial, local, and regional economic development entities to implement the **Action Plan for Growing the Great Lakes Blue Economy**

Desired Outcomes

SHORT-TERM

The Great Lakes community recognizes the importance of basin-wide planning for climate resilient economic development

MID-TERM

Leverage support from the private sector and collaborate on resiliency efforts for the Great Lakes Basin

Climate resilience is considered a key factor in economic development

Private sector business planning and operations take resilience into account

LONG-TERM

The Great Lakes blue economy is healthy, adaptable to changing conditions, and resilient to a changing climate

Recommended Action 4.2

Recommended Output 4.2

GLC evaluates and publicizes economic impact of resilient investments in the Great Lakes

GLC identifies suitable case studies from the public and private sectors to showcase transferability and lessons learned

GLC assesses regional clusters/regional development plans to identify best practices, identify innovative financing options for localities GLC partners with Great Lakes community to highlight economic impact of new and existing resilient infrastructure investments

GLC partners with Great Lakes community to highlight areas of greater risk & connect businesses and local governments to assessments

GLC partners with Great Lakes community to highlight new and existing climate resilience efforts via the Blue Accounting platform

Desired Outcomes

SHORT-TERM

Great Lakes community recognizes the impacts of climate change on economies

MID-TERM

Great Lakes community implements economic development strategies that maximize climate resilience

LONG-TERM

Great Lakes community recognizes the co-benefits of economic development and environmental stewardship

Supporting Actions

The GLC recognizes that overarching challenges related to capacity and data apply to each of the four targeted areas of focus described above. The following recommendations provide additional foundational support necessary to achieve goals related to individuals and communities, buildings and infrastructure, ecosystems, and the economy.

Capacity Building

Local capacity is often limited in its ability to evaluate and address risks related to changing conditions and climate stressors. Governments, tribes, first nations, municipal authorities, non-governmental organizations, and academia should collaborate to build regional capacity so that all communities can evaluate risks, plan, and implement strategies to increase resilience throughout the Great Lakes basin. The Great Lakes community should also recognize the unique capacity needs of Tribes, First Nations, Métis communities, communities of color, and low-income communities. Providing and securing funding to support community capacity building that reflects the broad spectrum of needs will be an ongoing challenge that the Great Lakes community should work collaboratively to address.

Recommended Action 5.1

The Great Lakes community collaborates to build local capacity through training and guidance materials on how to plan and implement strategies that contribute to adaptation and resilience

The Great Lakes community, in partnership with the Great Lakes – St. Lawrence Cities Initiative, develops, compiles, and advocates for resources and funding that help municipal authorities increase planning capacity and develop resilience plans for communities, infrastructure, ecosystems, and economies

Recommended Output 5.1

GLC develops model polices and/or recommendations to facilitate sharing of best practices across jurisdictional levels

Desired Outcomes

SHORT-TERM

Municipalities are aware of and can utilize climate resilience tools to assess climate risks to their operations and infrastructure

Communities have a better and broader understanding of the impacts of climate change on the Great Lakes basin, access to data, information, and tools, as well as potential solutions

MID-TERM

Communities convene through regional workshops to collaborate, share best practices, and identify opportunities for regional partnership

LONG-TERM

Communities use understanding of the impacts of climate change to prioritize and invest in activities that contribute to resilience to climate stressors

Great Lakes basin communities are more resilient to changing conditions and climate-related stressors

Supporting Actions

Data and Evaluation

The GLC recognizes that the data, tools, and resources will continue to develop over time. As such, the GLC will provide a forum through its annual and semiannual meetings to augment existing efforts that connect members of the Great Lakes community with each other to share knowledge and develop shared priorities for action. This should include a coordinated approach to monitoring and forecasting the impacts of a changing climate on ecosystems, human systems, and socio-economic factors. The GLC offers the following recommendations to collect and analyze data and to track progress:

Recommended Action 6.1

Recommended Output 6.1

Assess availability and accessibility of existing climate resilience knowledge, resources, and tools; identify gaps; work with stakeholders to fill gaps GLC develops a publicly available interactive resource library to highlight existing climate resilience knowledge, resources, and tools

GLC develops a blueprint to guide data collection and progress measurement for resilient infrastructure investments

Desired Outcomes

SHORT-TERM

The Great Lakes community understands how to access knowledge, resources, and tools to address risks related to changing conditions and climate-related stressors in the Great Lakes basin

MID-TERM

Implementation of adaptation and resilience programs are based on regularly updated forecasts, risk assessments, and best practices

The Great Lakes community prioritizes investment and activities in areas of urgent need and lays foundation for longer-term actions

LONG-TERM

The Great Lakes basin maintains a robust forecasting, risk assessment, and best practice database to help plan for the changing conditions and climate-related stressors

The Great Lakes community understands regional strengths and efforts of programs and gaps in resilience program efforts, identify climate threats and vulnerabilities to drive further efforts

Recommended Output 6.2

GLC partners with the Great Lakes community to highlight current science, research, TEK, forecasting, and monitoring through Blue Accounting

Recommended Action 6.2

The Great Lakes community collaboratively advances more comprehensive research, monitoring and surveillance of climate-related parameters, and assesses risks to ecosystems relative to current conditions and projected scenario data

GLC convenes forum to highlight current science, research, TEK, and monitoring with respect to policies and programs that contribute to climate resilience. This forum will identify strengths and gaps and advocate for additional resources to bolster science, research, and monitoring efforts

Desired Outcomes

SHORT-TERM

The Great Lakes community prioritizes and implements climate resilience strategies based on updated science, research, TEK, forecasting, and monitoring

MID-TERM

The Great Lakes community eliminates gaps in science, research, TEK, and monitoring with respect to climate resilience in the Great Lakes basin

LONG-TERM

The Great Lakes community has equitable access to comprehensive science, research, and TEK, forecasting, and monitoring

Supporting Actions

Assessing Progress and Addressing Emerging Challenges

As the GLC and its partners work toward the goals for resiliency, continually assessing progress and adapting approaches to meet the needs of current and emerging challenges will be critical. The GLC is committed to reporting on progress and facilitating regular discussions through its annual and semiannual meetings. This will include the following components:

Development of metrics to measure progress Progress reports on goals (visualized through Blue Accounting) Prioritization of activities, setting timeframes, identifying key participants

Recommended Action 7.1

GLC facilitates development of a common set of metrics (including existing metrics such at the State of the Great Lakes reports) to determine the current state of Great Lakes climate resilience and measure progress

Desired Outcomes

SHORT-TERM

The Great Lakes community collects data on projects and policies that inform future investments

MID-TERM

The Great Lakes community can evaluate efficacy of projects and policies on an ongoing basis

Recommended Output 7.1

GLC partners with the Great Lakes community to show progress through Blue Accounting

LONG-TERM

The Great Lakes community can demonstrate incremental progress and completion of goals related to climate resilience

Conclusion

Building a resilient and adaptive Great Lakes basin will be a long-term endeavor that requires thoughtful coordination and inclusive dialogue with all members of the Great Lakes community. Regularly convening members, setting common goals, developing metrics to assess progress toward those goals, and using data to adapt our approaches to meet current and emerging needs will ensure efforts support the resilience, adaptive capacity health and vitality of the people, places, environment, and sustainable economy of the Great Lakes basin for current and future generations.

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The Great Lakes Commission is a binational government agency established in 1955 to protect the Great Lakes and the economies and ecosystems they support. Its membership includes leaders from the eight U.S. states and two Canadian provinces in the Great Lakes basin. The GLC recommends policies and practices to balance the use, development, and conservation of the water resources of the Great Lakes and brings the region together to work on issues that no single community, state, province, or nation can tackle alone. Learn more at **www.glc.org.**